MA 20104 Probability and Statistics (3-0-0 3 credits)

1. **Probability:** Classical, relative frequency and axiomatic definitions of probability, addition rule and conditional probability, multiplication rule, total probability, Bayes' Theorem and independence, problems. **6 Lectures**

2. **Random Variables:** Discrete, continuous and mixed random variables, probability mass, probability density and cumulative distribution functions, mathematical expectation, moments, moment generating function, median and quantiles, Chebyshev's inequality, problems. **4 Lectures**

3. **Special Distributions:** Discrete uniform, binomial, geometric, negative binomial, hypergeometric, Poisson, continuous uniform, exponential, gamma, Weibull, Pareto, beta, normal, Cauchy distributions, reliability of series and parallel systems, problems. **6 Lectures**

4. **Function of a Random Variable:** Distribution of function of a random variable, problems. **2 Lecture**

5. **Joint Distributions:** Joint, marginal and conditional distributions, product moments, correlation, independence of random variables, bivariate normal distribution, problems. **4 Lectures**

6. **Transformations**: functions of random vectors, distributions of sums of random variables, problems. **2 Lectures**

7. **Sampling Distributions:** The Central Limit Theorem, distributions of the sample mean and the sample variance for a normal population, Chi-Square, t and F distributions, problems. **2 Lectures**

8. **Estimation:** Unbiasedness, consistency, the method of moments and the method of maximum likelihood estimation, confidence intervals for parameters in one sample and two sample problems of normal populations, confidence intervals for proportions, problems. **4 Lectures**

9. **Testing of Hypotheses:** Null and alternative hypotheses, the critical and acceptance regions, two types of error, power of the test, the most powerful test and Neyman-Pearson Fundamental Lemma, tests for one sample and two sample problems for normal populations, tests for proportions, Chi-square goodness of fit test and its applications, problems. **6 Lectures**

Text/References

1. An Introduction to Probability and Statistics by V.K. Rohatgi & A.K. Md. E. Saleh
2. Probability and Statistical Inference by Hogg, R. V., Tanis, E. A. & Zimmerman D. L.
3. Probability and Statistics in Engineering by W.W. Hines, D.C. Montgomery, D.M. Goldsman, C.M. Borror
4. Introduction to Probability and Statistics for Engineers and Scientists by S.M. Ross
5. Introduction to Probability and Statistics by J.S. Milton & J.C. Arnold.
6. Introduction to Probability Theory and Statistical Inference by H.J. Larson
7. Probability and Statistics for Engineers and Scientists by R.E. Walpole, R.H. Myers, S.L. Myers, Keying Ye
8. Modern Mathematical Statistics by E.J. Dudewicz & S.N. Mishra
9. Introduction to the Theory of Statistics by A.M. Mood, F.A. Graybill and D.C. Boes

Lecture Schedule

January: 4 (2), 5, 11 (2), 12, 18 (2), 19, 25 (2) (11 lectures)

February: 1 (2), 2, 8 (2), 9, 15 (2), 22 (2), 23 (11 lectures)

March: 8 (2), 9, 15 (2), 16, 22 (2), 23, 30 (10 lectures)

April: 5 (2), 6, 12 (2), 13 (6 lectures)

Total : 38 lectures

Slot : A3 -- Monday 8:00 – 10:00, Tuesday 12:00 – 13:00

Section 1. Prof. Bibhas Adhikari: AG (76) + HS (46) + MF (55) + other departments not listed in any section (These are all Students of 2019 batch)

Section 2. Prof. Prateep Chakrborty: CE (98) + IM (61) + ME (These are all Students of 2019 batch)

Section 3. Prof. Somesh Kumar (C): BT (56) + CS (119) + CH (These are all Students of 2019 batch)

Section 4: Prof. Buddhananda Banerjee: MA (56) + MI (95) + QE (7) + QM (8) (These are all Students of 2019 batch) + All Backlogs + all other students of batches prior to 2019